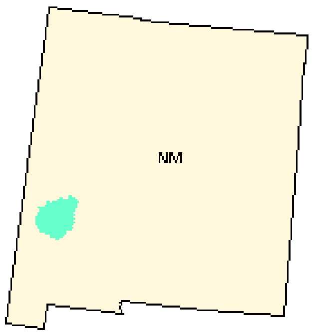
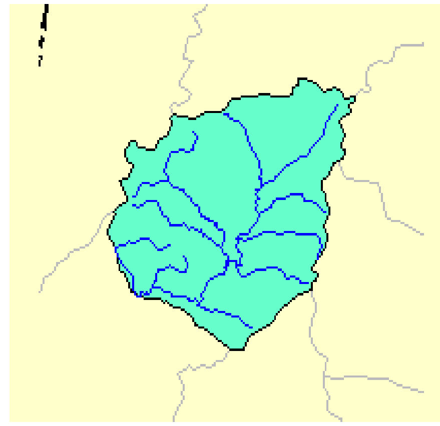
DRAFT
TOTAL MAXIMUM DAILY LOAD FOR
TOTAL ORGANIC CARBON (TOC) ON SAPILLO CREEK





Summary Table

New Mexico Standards Segment	Gila River, 20.6.4.503 NMAC (formerly 2503)
Water body Identifier	Sapillo Creek from the mouth on the Gila River to Lake Roberts (GRB1-10300), 5.0 miles
Parameters of Concern	Total Organic Carbon (TOC)
Uses Affected	High quality coldwater fishery
Geographic Location	Upper Gila River Basin (GRB1-10300)
Scope/size of Watershed	TMDL area: 173 mi^2
Land Type	Ecoregions: New Mexico/Arizona Mountains
Land Use/Cover	Forest (80 %), Rangeland (15%), Agriculture (3%), Water (2 %)
Identified Sources	Unknown, Hydromodification, Road maintenance/runoff, Removal of Riparian Vegetation, Streambank Modification/Destabilization, upstream impoundment, nuisance algae
Watershed Ownership	Forest Service (97 %), Private (3 %)
Priority Ranking	4
Threatened and Endangered Species	No
TMDL for: Total Organic Carbon (TOC)	WLA + LA + MOS = TMDL **0 + 42.03 + 7.42 = 49.45 lbs/day**

Table of Contents

Table of Contents (Cont'd)

List of Abbreviations

BMP	Best Management Practice
BLM	United States Department of Interior Bureau of Land Management
CCCG	Catron County Citizens Group
CFS	Cubic Feet per Second
CWA	Clean Water Act
CWAP	Clean Water Action Plan
CWF	Coldwater Fishery
DOC	Dissolved Organic Carbon Fraction
EPA	United States Environmental Protection Agency
FS	United States Department of Agriculture Forest Service
GM	Gila Monster
GNF	Gila National Forest
HQCWF	High Quality Coldwater Fishery
LA	Load Allocation
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MOS	Margin of Safety
MOU	Memorandum of Understanding
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSGF	New Mexico State Game and Fish
NMSHD	New Mexico State Highway and Transportation Department
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
POC	Particulate Organic Carbon Fraction
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
USGS	United States Geological Survey
UWA	Unified Watershed Assessment
WLA	Waste Load Allocation
WPS	Watershed Protection Section
WQLS	Water Quality Limited Segment
WQCC	New Mexico Water Quality Control Commission
WQS	Water Quality Standards

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to develop Total Maximum Daily Load (TMDL) management plans for waterbodies determined to be water quality limited. A TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's water quality standards. It also allocates that load capacity to known point sources and nonpoint sources at a given flow. TMDLs are defined in 40 CFR Part 130 as the sum of the individual Waste Load Allocations (WLA) for point sources and Load Allocations (LA) for nonpoint sources, including a margin of safety (MOS), and natural background conditions.

The Sapillo Creek watershed is a sub-basin of the greater Gila River Basin, located in southwestern New Mexico. Two stations were located on the creek to evaluate the impact of the watershed and to establish background conditions. As a result of this monitoring effort, several exceedances of New Mexico water quality standards for total organic carbon (TOC) were documented on Sapillo Creek as a source of impairment for the high quality coldwater fishery Designated Use. This TMDL document addresses TOC for the impacted 5.0-mile stretch of Sapillo Creek.

Looking downstream at SWQB staff preparing to collect a benthic macrinvertebrate sample from Sapillo Creek.

A general implementation plan for activities to be established in the watershed is referred to in this document. The Surface Water Quality Bureau (SWQB), Watershed Protection Section (WPS), will further develop the details of this plan. Implementation of recommendations in this document will be done with full participation of all interested and affected parties. During implementation, additional water quality data will be collected. As a result targets will be re-examined and potentially revised; this document is considered to be an evolving management plan. In the event that new data indicate that the targets used in this analysis are not appropriate or if new standards are adopted, the load capacity will be adjusted accordingly. When water quality standards have been achieved, the reach will be removed from the 303(d) list.

Background Information

Sapillo Creek below Lake Roberts

The Sapillo Creek watershed is approximately 173 mi^2 and is located in southwestern New Mexico. The Sapillo Creek watershed is dominated by forest and rangeland, with some agriculture, and water (Figure 1). Sapillo Creek flows as a discharge from Lake Roberts, to the Gila River, and is a primary, perennial tributary. The watershed is almost entirely Forest Service (FS) managed lands, with privately held lands along the riparian corridor (Figure 2). Currently, The Nature Conservancy has acquired the allotments, which are the drainage area to Lake Roberts. The Gila National Forest drained and dredged Lake Roberts in 1993, and the lake was drained again, approximately 6 years ago, due to a structural accident. Sediment-laden waters were discharged along Sapillo Creek for several weeks. Surface water quality monitoring stations were used to characterize the water quality of the stream reaches. Stations were located below the lake and at the wilderness boundary to evaluate the impact on the stream and to establish background conditions. Several sample results exceed New Mexico water quality standards for TOC, and were documented in summer and fall of 1999, as part of a three season monitoring regime.

Endpoint Identification

Target Loading Capacity

Overall, the target values for this total organic carbon TMDL will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator and 3) the ability to easily monitor and produce quantifiable and reproducible results. Organic matter content is typically measured as total organic carbon and dissolved organic carbon, which consists of components including: macroscopic particles, colloids, dissolved micro molecules, and specific compounds. TOC measurements are affected by the climate and the amount of vegetation within, or contributing to detritus in the water body. For this TMDL document target values for total organic carbon are based on numeric criteria. This TMDL is consistent with the State's antidegradation policy.

Figure 1

Upper Gila Watershed - 15040001
Land Use/Cover
6th Code Watersheds

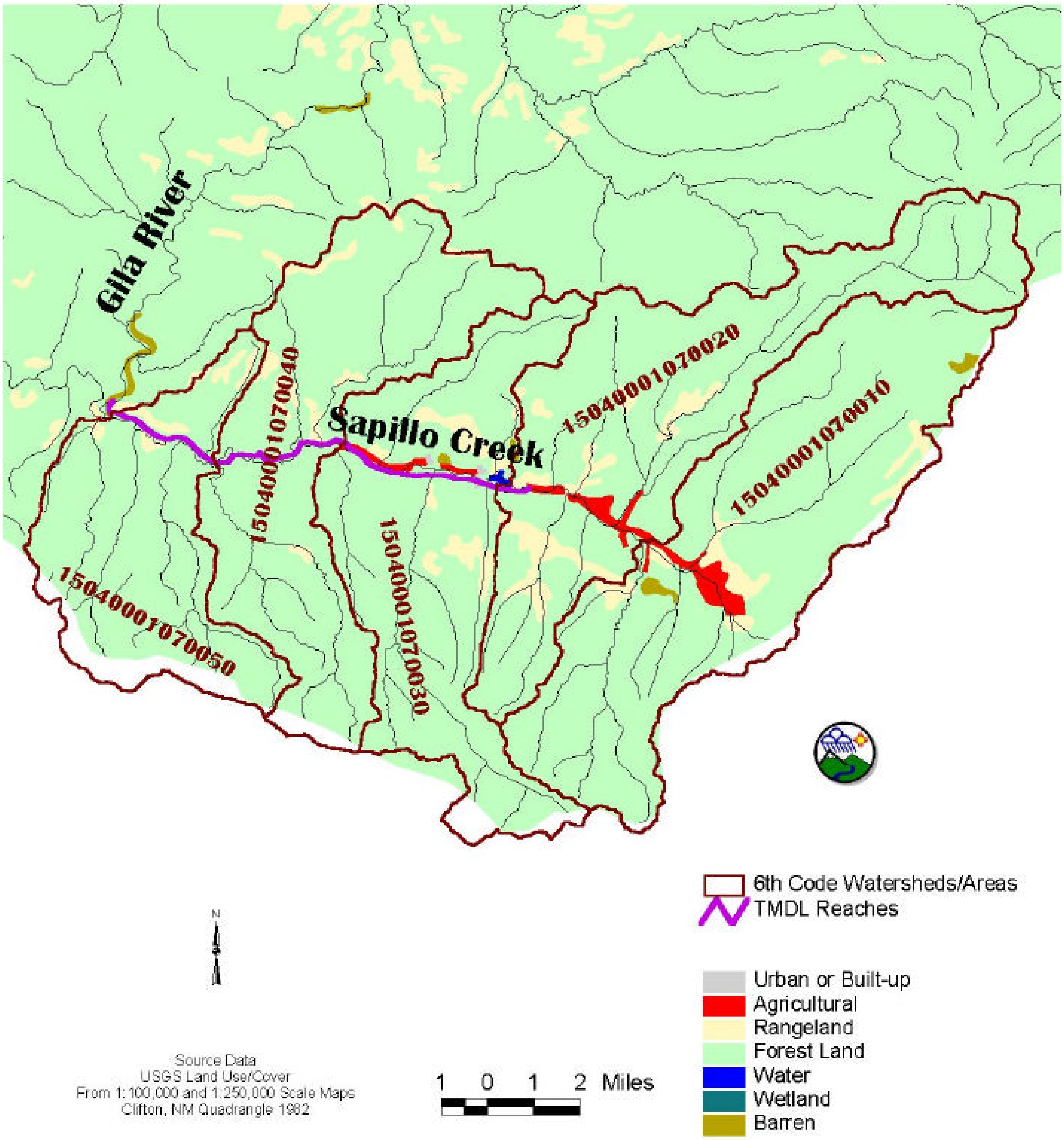
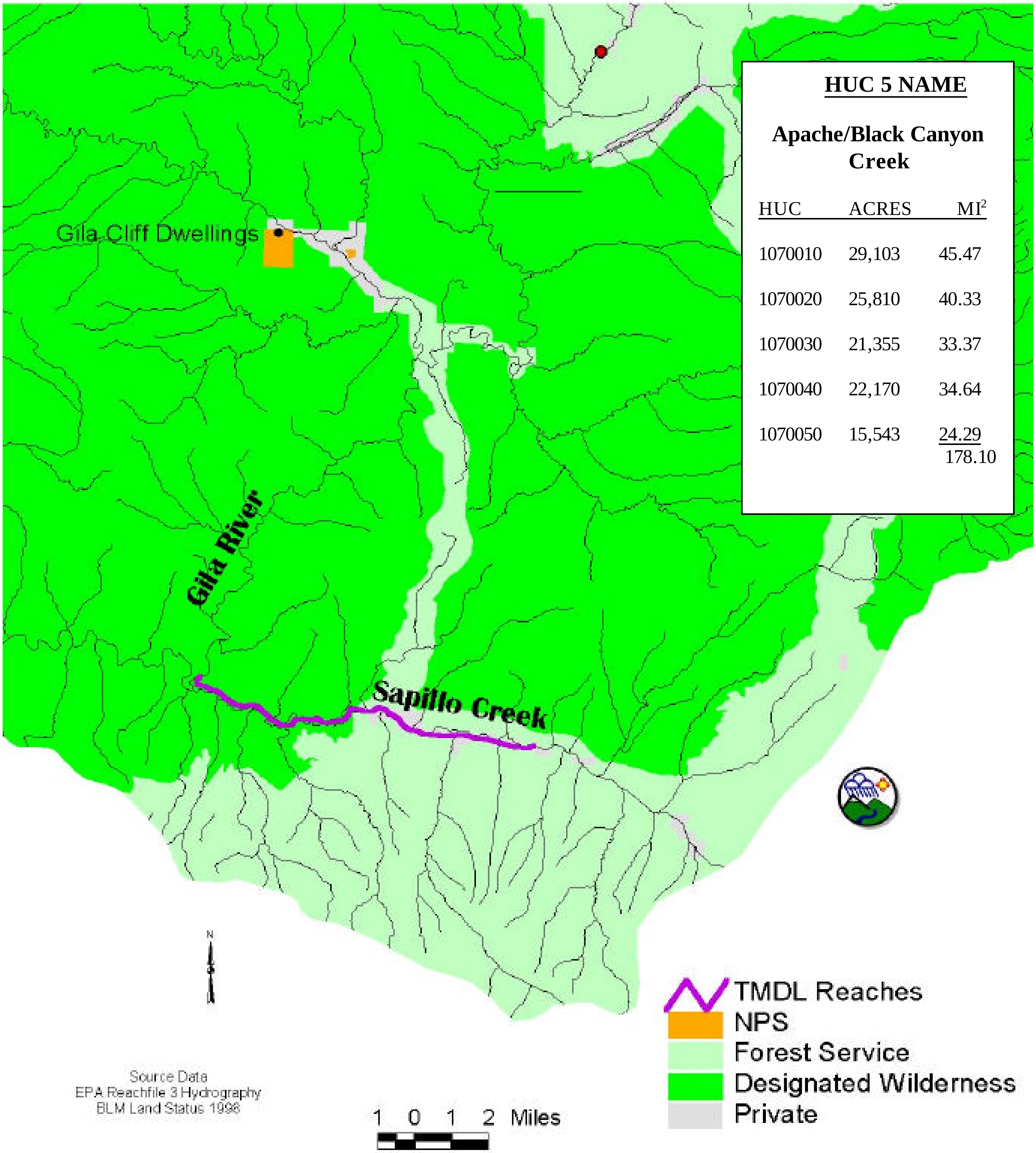


Figure 2

Upper Gila Watershed - 15040001
Land Ownership



HUC 5 NAME

Apache/Black Canyon Creek

HUC	ACRES	MI^2
1070010	29,103	45.47
1070020	25,810	40.33
1070030	21,355	33.37
1070040	22,170	34.64
1070050	15,543	24.29
		178.10

Total Organic Carbon

The water quality standards specify that "total organic carbon shall not exceed 7 mg/l" for any water designated by the New Mexico Water Quality Control Commission as a high quality coldwater fishery (HQCWF). Sapillo Creek is in standard segment 20.6.4.503 NMAC (formerly 2503), which includes:

> The main stem of the Gila River from Gila hot springs upstream to the headwaters and all perennial tributaries to the Gila River at or above the town of Cliff.

Flow

TOC movement in a stream varies as a function of flow. As flow decreases, the concentration of some pollutants increases. TMDLs are calculated for each reach at a specific flow. In this case the target flow was critical low flow.

When available, United States Geological Survey (USGS) gages are used to estimate flow. Where gages are absent or poorly located along a reach, either actual flow (measured as water quality samples are taken) is used as target flows or geomorphologic sectional information is taken to model the flows. In this case, 1) there was no USGS gage for Sapillo Creek, 2) the critical flow was modeled and 3) the presence of TOC can vary in a stream as a function of flow. As flow decreases, concentrations of TOC can increase. Thus, a TMDL is calculated for each reach at a particular flow. The flow value used to calculate the TMDL for TOC on Sapillo Creek obtained using the 4-day, 3-year low flow frequency 4Q3 regression model (Appendix B). The New Mexico Surface Water Quality Standards (20.6.4 NMAC) describe critical low flow using the term 4Q3. The 4Q3 is the minimum arithmetic average four-consecutive-day flow, which occurs with a frequency of once in three years. This flow is used in calculation of point source (NPDES) permit wasteload allocations (WLA) and in the development of total maximum daily loads (TMDLs).

It is important to remember that the TMDL is a planning tool to be used to achieve water quality standards. Since flows vary throughout the year in these systems at water quality standards the target load will vary based on the changing flow. Management of the load should set a goal of water quality standards attainment, not of meeting the calculated target load.

Calculations

A target load for TOC is calculated based on a flow, the current water quality standards, and a unit-less conversion factor, 8.34 that is used to convert mg/L units to lbs/day (see Appendix A for Conversion Factor Derivation). The target loads (TMDLs) predicted to attain standards were calculated using Equation 1 and are shown in Table 1.

Equation 1. *critical flow (mgd) x standard (mg/L) x 834 (conversion factor) = target loading capacity*

Table 1: Calculation of Target Loads

Location	Flow+ (mgd)	Standard TOC (mg/L)	Conversion Factor	Target Load Capacity (lbs/day)
Sapillo Creek	0.847	7.0	8.34	49.45

+Because there is no USGS station on this reach, the flow is the 4Q3 flow of 1.31 cfs, which converts to 0.847 mgd. See Appendix B for derivation.

The currently measured loads were calculated using Equation 1. The flows used were taken from the critical low flow, 4Q3 determination. The geometric mean of the data (Appendix C) that exceeded the standards from the data collected at each site for TOC was substituted for the standard in Equation 2. The same conversion factor of 8.34 was used. Results are presented in Table 2.

Table 2: Calculation of Measured Loads

Location	Flow+ (mgd)	Field Measurements* (mg/L)	Conversion Factor	Measured Load (lbs/day)
Sapillo Creek	0.847	9.51	8.34	67.18

+Because there is no USGS station on this reach, the flow is the 4Q3 flow of 1.31 cfs, which converts to 0.847 mgd. See Appendix B for derivation
*Field data, Appendix C

Background loads were not possible to calculate in this watershed. It is assumed that a portion of the load allocation is made up of natural background loads. This will be a future determination based on applicability of a suitable reference reach.

Waste Load Allocations and Load Allocations

Waste Load Allocation

There are no point source contributions associated with this TMDL. The waste load allocation is zero.

Load Allocation

In order to calculate the load allocation (LA) the waste load allocation (WLA) and margin of safety (MOS) were subtracted from the target capacity (TMDL) following Equation 2.

Equation 2. $WLA + LA + MOS = TMDL$

Results are presented in Table 3 (Calculation of TMDLs for Total Organic Carbon).

Table 3: Calculation of TMDL for Total Organic Carbon

Location	WLA (lbs/day)	LA (lbs/day)	MOS (lbs/day)	TMDL (lbs/day)
Sapillo Creek	0	42.03	7.42	49.43

The load reductions that would be necessary to meet the target loads were calculated to be the difference between the target load (Table 1) and the measured load (Table 2), and are shown in Table 4 (Calculation of Load Reductions). Achieving the target load of 49.45 lbs/day of TOC would require a load reduction of 17.73 lbs/day. Achieving the target load for TOC on Sapillo Creek would require a load reduction of approximately 26.4 %.

Table 4: Calculation of Load Reductions (in lbs/day)

Location	Target Load	Measured Load	Load Reduction
Sapillo Creek	49.43	67.18	17.75 (26.4%)

Identification and Description of Pollutant Source(s)

Table 5: Pollutant Source Summary

Pollutant Sources (% from each)	Magnitude (WLA + LA + MOS)	Location	Potential Sources
Point: (0%) None	0	--------	None
Nonpoint: (100%) TOC (lbs/day)	49.45	Sapillo Creek	Unknown, Hydromodification, Road maintenance/runoff, Removal of Riparian Vegetation, Streambank Modification/Destabilization, upstream impoundment, nuisance algae

Linkage of Water Quality and Pollutant Sources

Where available data are incomplete or where the level of uncertainty in the characterization of sources is large, the recommended approach to TMDLs requires the development of allocations based on estimates utilizing the best available information. Data that were collected and used for the calculation of the existing condition for the creek, with respect to total organic carbon, are included in Appendix C.

TOC has important implications for the occurrence and fate of surface water contaminants because it can: (1) increase the solubility and facilitate the transport of organic contaminants, (2) alter rates of biodegradation, (3) form complexes with trace metals, and (4) react during water treatment to produce potentially toxic by-products. TOC has two primary components, a dissolved and particulate fraction (DOC and POC, respectively). The DOC, measured as a component of TOC, is the most readily bioavailable, and presents the major concern for the degradation of water quality. Major sources of DOC in streams and rivers are found within riparian zones and stream channels. In addition to DOC excreted by primary producers in the channel, DOC is rapidly leached from terrestrial leaves falling into streams. A more important DOC source appears to be DOC leached from material stored in the streambed. Leaching of this material is facilitated by biological activity and, in some cases, may occur under anaerobic conditions. The amount of DOC produced by these kinds of sources has been reduced by human activities that reduce channel storage and disconnect rivers from their floodplains. Other sources are typical anthropogenic sources such as septic tank leach fields and land use activities that result in watershed organic deliveries to watercourses that are higher than the assimilative capacity of the sources of removal.

Abiotic processes including sorption, photooxidation, and particle formation remove the dissolved fraction from the water column. Biotic utilization of DOC is largely bacterial and varies with the chemical nature of DOC and the bacterial community. Epilithic microbial communities are important sites for DOC uptake in many streams. The extent of contact between water and sediments is a critical determinant of rates of DOC utilization in rivers. Consequences of DOC utilization include alteration of biogeochemical cycling of other elements and an increase in secondary production in the ecosystem.

Changes in the concentrations of TOC and its DOC can cause reductions in primary productivity and system metabolism, while increasing susceptibility to toxic metals and acidification. Increases in organic carbon concentrations can increase bacterial metabolism to the point of causing anoxic conditions.

SWQB fieldwork includes an assessment of the potential sources of impairment (Appendix D) provides an approach for a visual analysis of a pollutant source along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed.

Table 5 (Pollutant Source Summary) identifies and quantifies potential sources of nonpoint source impairments along each reach as determined by field reconnaissance and assessment. A further explanation of the sources follows.

Sapillo Creek

The Gila National Forest drained and dredged Lake Roberts in 1993, and the lake was drained again, approximately 6 years ago, due to a structural accident. Sediment-laden waters were discharged along Sapillo Creek, for duration of several weeks. Other probable causes of TOC exceedences can be attributed to upstream impoundment effects, detritus contributions and leach fields from septage facilities.

Sapillo Creek at the Wilderness boundary, Macro-invertebrate Collection

Margin of Safety (MOS)

TMDLs should reflect a margin of safety based on the uncertainty or variability in the data, the point and nonpoint source load estimates, and the modeling analysis. For this TMDL, there will be no margin of safety for point sources since there are no point sources permitted along this reach. However, for the nonpoint sources the margin of safety is estimated to be an addition of **15%** for TOC of the TMDL, excluding the background. This margin of safety incorporates several factors:

Errors in calculating NPS loads

A level of uncertainty exists in sampling nonpoint sources of pollution. Accordingly, a conservative margin of safety for total organic carbon increases the TMDL by **10%**.

Errors in calculating flow

Flow estimates were based on a modeled flow. To be conservative, an addition of **5%** MOS to account for accuracy of flow measures will be included.

Consideration of Seasonal Variation

Data used in the calculation of this TMDL were collected during spring, summer, and fall in order to ensure coverage of any potential seasonal variation in the system. Critical condition is set to the lowest critical flows, as determined by the 4Q3 determination for total organic carbon. TOC movement in a stream varies as a function of flow. As flow decreases, the concentration of some pollutants increases.

TMDLs are calculated for each reach at a specific flow. In this case the target flow was critical low flow. Data where exceedances were seen were used in the calculation of the measured loads.

Future Growth

Future growth and growth estimates are of interest to Western New Mexico University (WNMU) who, in cooperation with other groups and agencies, has produced documentation pertaining to Socio-Economic studies of the southwestern counties in an attempt to better understand trends. Estimations of future growth are not anticipated to lead to a significant increase for total organic carbon that cannot be controlled with best management practice implementation in this watershed.

Monitoring Plan

Pursuant to Section 106(e)(1) of the Federal Clean Water Act, SWQB has established appropriate monitoring methods, systems and procedures in order to compile and analyze data on the quality of the surface waters of New Mexico. In accordance with the New Mexico Water Quality Act, SWQB has developed and implemented a comprehensive water quality monitoring strategy for the surface waters of the State. The monitoring strategy establishes the methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used to progress toward three basic monitoring objectives: to develop water quality-based controls, to evaluate the effectiveness of such controls and to conduct water quality assessments.

The SWQB utilizes a rotating basin system approach to water quality monitoring. In this system, a select number of watersheds are intensively monitored each year with an established return frequency of every five to seven years.

The SWQB maintains current quality assurance and quality control plans to cover all monitoring activities. This document, "Quality Assurance Project Plan for Water Quality Management Programs" (QAPP) is updated annually (SWQB/NMED 2001). Current priorities for monitoring in the SWQB are driven by the 303(d) list of streams requiring TMDLs. Short-term efforts will be directed toward those waters which are on the EPA TMDL consent decree (Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, US EPA, Civil Action 96-0826 LH/LFG, 1997) list and which are due within the first two years of the monitoring schedule.

Once assessment monitoring is completed those reaches showing impacts and requiring a TMDL will be targeted for more intensive monitoring. The methods of data acquisition include fixed-station monitoring, intensive surveys of priority water bodies, including biological assessments, and compliance monitoring of industrial, federal and municipal dischargers, and are specified in the SWQB Assessment Protocol (SWQB/NMED revised 10-2-2000).

Long term monitoring for assessments will be accomplished through the establishment of sampling sites that are representative of the waterbody and which can be revisited every five to seven years. This gives an unbiased assessment of the waterbody and establishes a long term monitoring record for simple trend analyses. This information will provide time relevant information for use in 305(b) assessments and to support the need for developing TMDLs.

The approach provides:

- systematic, detailed review of water quality data, allowing for a more efficient use of valuable monitoring resources;
- information at a scale where implementation of corrective activities is feasible;
- established order of rotation and predictable sampling in each basin which allows for enhanced coordinated efforts with other programs; and
- program efficiency and improvements in the basis for management decisions.

It should be noted that a basin would not be ignored during its five to seven year sampling hiatus. The rotating basin program will be supplemented with other data collection efforts. Data will be analyzed, field studies will be conducted to further characterize acknowledged problems, and TMDLs will be developed and implemented. Both long term and field studies can contribute to the 305(b) report and 303(d) listing processes.

The following schedule is a draft for the sampling seasons through 2002 and will be followed in a consistent manner to support the New Mexico Unified Watershed Assessment (UWA) and the Nonpoint Source Management Program. This sampling regime allows characterization of seasonal variation and through sampling in spring, summer, and fall for each of the watersheds.

- 1998 Jemez Watershed, Upper Chama Watershed (above El Vado), Cimarron Watershed, Santa Fe River, San Francisco Watershed
- 1999 Lower Chama Watershed, Red River Watershed, Middle Rio Grande, Gila River Watershed (summer and fall), Santa Fe River
- 2000 Gila River Watershed (spring), Dry Cimarron Watershed, Upper Rio Grande 1 (Pilar north to the NM/CO border), Shumway Arroyo
- 2001 Upper Rio Grande 2 (Pilar south to Cochiti Reservoir), Upper Pecos Watershed (Ft Sumner north to the headwaters
- 2002 Lower Pecos Watershed (Roswell south to the NM/TX border including Ruidoso), Canadian River Watershed, Lower Rio Grande (southern border of Isleta Pueblo south to the NM/TX border), San Juan River Watershed, Rio Puerco Watershed, Closed Basins, Zuni Watershed, Mimbres Watershed

Implementation Plan

Management Measures

Management measures are "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, citing criteria, operating methods, or other alternatives"(USEPA, 1993). A combination of best management practices (BMPs) will be used to implement this TMDL.

Introduction

Most organic carbon in water occurs as partly degraded plant and animal materials, some of which are resistant to microbial degradation. Biochemical Oxygen Demand (BOD or BOD5) is an indirect measure of biodegradable organic compounds in water. The BOD of wastewater is a common indicator of the fraction of organic matter that may be degraded by microbial action, in a given time period, at a temperature of 20 degrees Centigrade. The test is related to the oxygen that would be required to stabilize the quantity of organic material capable of being oxidized, after discharging to a receiving body of water. TOC measurements have been used as a method for determining pollution levels of wastewater for many years. Total organic carbon consists of two fractions: dissolved organic carbon and particulate organic carbon. TOC provides an indication of the total organic material present. It is often used as an indicator (but not a measure) of the amount of waste available for biodegradation. TOC includes the carbon both from naturally occurring organic material and organic chemical contaminants. By using TOC measurements, the number of carbon-containing compounds in a source can be determined. This is important because knowing the amount of carbon in a freshwater stream is an indicator of the organic character of the stream (Federal Remediation Technology Roundtable 1998).

The aquatic life guidelines (HQCWF standard) is expressed in terms of the total TOC concentrations.

Changes in the concentrations of TOC, and its dissolved organic carbon fraction (DOC), can cause reductions in primary productivity, system metabolism, while increasing susceptibility to toxic metals and acidification. Increases in organic carbon concentrations can increase bacterial metabolism to the point of causing anoxic conditions. This generates a by-product of over enrichment of a receiving water body. The production of haloforms in drinking source water, as a result of the reaction between organic carbon compounds and hypochlorous acid (chlorine disinfection), is a serious drinking water quality issue. A study with drinking water supplies in the US has shown that the probability of exceeding the trihalomethane concentration of 100 micrograms/L, following chlorination, is minimal for the finished drinking water containing total organic carbon level of less than or equal to 2 mg/L.

The recently issued Disinfectants and Disinfection By-Products Rule by the US Environmental Protection Agency specifies maximum total organic carbon levels of 2 mg/L in treated water and 4 mg/L in source water to ensure acceptable levels of disinfection byproducts.

Through source water treatment technology, a positive correlation has been shown, that a reduction in source water turbidity produces a reduction in TOC. Turbidity removal, along with the color of the water, are key features of raw surface waters that influence the application of coagulation in treating water for drinking water purposes. For example, the flocculent dose needed in treating source water for drinking, is strongly determined by the sum of the negative surface charges of inorganic particles (clay and loam), organic particles (algal cells) and naturally occurring dissolved macromolecular organics (all potential components of a TOC measurement). The reduction in turbidity, with coagulant dosing, contrasts changes in levels/concentrations of other parameters such as TOC/DOC, UV absorbance and color. (J. van Leeuwen, et al. ,1998).

The State of New Mexico has not established a drinking water quality guideline for dissolved or total organic carbon. However, it has recommended guidelines for parameters that are related to dissolved and total organic carbon. Many drinking water quality issues associated with high levels of organic carbon may be addressed through total dissolved solids standards and turbidity (maximum acceptable concentration: 10 NTU) restrictions.

Wildlife can be directly or indirectly affected by changes in organic carbon levels in aquatic systems. Studies have also shown that total organic carbon is strongly correlated with water color. For instance, abundance of loons in aquatic environments in Canada, require clear water to sight their prey, have been negatively correlated with TOC and DOC levels which render aquatic systems highly colored. Organic carbon forms complexes with some metals (*e.g.*, cadmium, copper, etc.), thus reducing their availability and toxicity to aquatic organisms. Conversely, mercury availability, bioaccumulation in fish and hence toxicity tend to increase in the presence of organic carbon. Indirect effects arise because organic carbon plays an important role in the productivity of aquatic systems and response of the aquatic systems to factors such as acid inputs (Water Management Branch, Environmental and Resource Management, Ministry of Environment, Lands and Parks, Canada).

Appropriate considerations must be given to these aspects when the existing water quality is assessed in an aquatic environment. Effects of organic carbon content in the aquatic environment should be assessed together with actual production of trihalomethanes after chlorination in drinking water, metal concentrations and their bioavailability, and compliance with related water quality guidelines (*e.g.*, THM, color, turbidity, etc. in drinking and ambient waters) (Water Management Branch, Environmental and Resource Management, Ministry of Environment, Lands and Parks, Canada).

Actions to be Taken

For this watershed the primary focus will be on the control of TOC.

During the TMDL process in this watershed, point sources have been reviewed and will be addressed through the permit process. The nonpoint source contributions will need to address total organic carbon exceedences through BMP implementation.

There are a number of BMPs that can be utilized to address TOC, depending on the source. Such BMPs include:

1. Protection and/or development of healthy riparian buffer strips to serve as filters for soils and potential contaminants that are transported during surface runoff. This runoff could be the result of activities in the watershed that disturb soils or cause a loss of vegetative ground cover. The riparian vegetation also helps to stabilize riverbanks with root structure which prevents excessive bank erosion and helps maintain the stability and natural morphology of the stream system. (Stream Corridor Restoration – Principles, Processes and Practices, 1998, The Federal Interagency Stream Restoration Working Group);

2. Placement of silt fences between roads and watercourses to prevent soils and contaminants, that are disturbed during road and other construction activities, from being carried into watercourses. Silt fences trap sediment that is carried during runoff events similar to a filter. When maintained properly, these silt fences are an effective erosion control measure that can be used throughout the State. (Erosion and Sediment Control Manual, 1993, Environment Department, Surface Water Quality Bureau); and

3. Placement of straw mulch on soils that have lost cover from vegetative groundcover during severe forest fires. The straw mulch helps prevent erosion during rainstorms and snowmelt by holding the bare topsoil and ash in place. The mulch can also aid in the infiltration of water and replace ground litter. This method works well on gentle slopes where there is no wind. (Cerro Grande Fire Burned Area Emergency Rehabilitation (BAER) Plan, 2000, Interagency Baer Team.

Additional sources of information for possible BMPs to address TOC, as resulting from organic carbon contributions, are listed below. Some of these documents are available for viewing at the New Mexico Environment Department, Surface Water Quality Bureau, Watershed Protection Section Library, 1190 St Francis Drive, Santa Fe New Mexico.

Agriculture

- Internet website:

  http://www.nm.nrcs.usda.gov/

- Bureau of Land Management, 1990, Cows, Creeks, and Cooperation: Three Colorado Success Stories. Colorado State Office.

- Cotton, Scott E. and Ann Cotton, Wyoming CRM: Enhancing our Environment.

- Goodloe, Sid and Susan Alexander, Watershed Restoration through Integrated Resource Management on Public and Private Rangelands.

- Grazing in New Mexico and the Rio Puerco Valley Bibliography.

- USEPA and The Northwest Resource Information Center, Inc., 1990, Livestock Grazing on Western Riparian Areas.

- USEPA and The Northwest Resource Information Center, Inc., 1993, Managing Change: Livestock Grazing on Western Riparian Areas.

Forestry

- New Mexico Natural Resources Department, 1983, Water Quality Protection Guidelines for Forestry Operations in New Mexico.

- New Mexico Department of Natural Resources, 1980, New Mexico Forest Practice Guidelines. Forestry Division, Timber Management Section

- State of Alabama. 1993. Alabama's Best Management Practices for Forestry.

Riparian and Streambank Stabilization

- Colorado Department of Natural Resources, Streambank Protection Alternatives. State Soil Conservation Board.

- Meyer, Mary Elizabeth, 1989, A Low Cost Brush Deflection System for Bank Stabilization and Revegetation.

- Missouri Department of Conservation, Restoring Stream Banks With Willows, (pamphlet).

- New Mexico State University, Revegetating Southwest Riparian Areas, College of Agriculture and Home Economics, Cooperative Extension Service, (pamphlet).

- State of Pennsylvania, 1986, A Streambank Stabilization And Management Guide for Pennsylvania Landowners. Department of Environmental Resources, Division of Scenic Rivers.

- State of Tennessee, 1995, Riparian Restoration and Streamside Erosion Control Handbook. Nonpoint Source Water Pollution Management Program.

Roads

- Becker, Burton C. and Thomas Mills, 1972, Guidelines for Erosion and Sediment Control Planning and Implementation, Maryland Department of Water Resources, # R2-72-015.

- Bennett, Francis William, and Roy Donahue, 1975, Methods of Quickly Vegetating Soils of Low Productivity, Construction Activities, US EPA, Office of Water Planning and Standards Report # 440/9-75-006.

- Hopkins, Homer T. and others, Processes, Procedures, and Methods to control Pollution Resulting from all Construction Activity,.US EPA Office of Air and Water Programs, EPA Report 430/9-73-007.

- New Mexico Natural Resources Department, 1983, Reducing Erosion from Unpaved Rural Roads in New Mexico, A Guide to Road construction and Maintenance Practices. Soil and Water Conservation Division

- New Mexico State Highway and Transportation Department and USDA-Soil Conservation Service, Roadside Vegetation Management Handbook.

- New Mexico Environment Department, 1993, Erosion and Sediment Control Manual. Surface Water Quality Bureau.

- USDA Forest Service Southwestern Region, 1996, Managing Roads for Wet Meadow Ecosystem Recovery. FHWA-FLP-96-016.

  Section V. New Construction and Reconstruction
  Section VI. Remedial Treatments
  Section VII. Maintenance

- USEPA, 1992, Rural Roads: Pollution Prevention and Control Measures (handout).

Storm Water

- Delaware Department of Natural Resources and Environmental Control, 1997, Conservation Design for Stormwater Management: A Design Approach to Reduce Stormwater Impacts From Land Development and Achieve Multiple Objectives Related to Land Use. Sediment and Stormwater Program and The Environment Management Center, Brandywine Conservancy.

- State of Kentucky, 1994, Kentucky Best Management Practices for Construction Activity. Division of Conservation and Division of Water.

- USEPA, 1992, Storm Water Management for Construction Activities – Developing Pollution Prevention Plans and Best Management Practices, Summary Guidance, EPA 833-R-92-001, pgs. 7- 9.

Miscellaneous

- Interagency Baer Team, 2000, Cerro Grande Fire Burned Area Emergency Rehabilitation (BAER) Plan, Section F. Specifications.

- New Mexico Environment Department, 2000, A Guide to Successful Watershed Health. Surface Water Quality Bureau.

- Roley, William Jr., Watershed Management and Sediment Control for Ecological Restoration.

- Rosgen, David, 1996, Applied River Morphology, Chapter 8. Applications (Grazing, Fish Habitat).

- Rosgen, David, 1997, A Geomorphological Approach to Restoration of Incised Rivers.

- The Federal Interagency Stream Restoration Working Group, 1998, Stream Corridor Restoration. Principles, Processes, and Practices.
  Chapter 8 – Restoration Design
  Chapter 9 – Restoration implementation, Monitoring, and Management

- USDA Forest Service Southwestern Region, Soil and Water Conservation Practices Handbook.

  Section 22, Range Management
  Section 23, Recreation Management
  Section 24, Timber Management
  Section 25, Watershed Management
  Section 26, Wildlife and Fisheries Management
  Section 41, Access and Transportation Systems and Facilities

- Unknown, Selecting BMPs and other Pollution Control Measures.

- Unknown, Environmental Management. Best Management Practices.

  Construction Sites
  Developed Areas

Sand and Gravel Pits
Farms, Golf Courses, and Lawns

Other BMP Activities in the Watershed

The following are activities in this watershed that have occurred, are occurring, or are in the planning stages to address total organic carbon sources or other nonpoint source issues in the Sapillo Creek watershed.

The Gila National Forest has been and continues to be involved in management activities on lands in the upper reaches of the Sapillo Creek watershed. Many of these management activities are undertaken to address issues with sediment, turbidity, and water temperature. Mining, grazing and logging were all historic uses made of the land. Currently, the Sapillo Creek watershed is managed with an emphasis focused on recreation, wildlife, fisheries, and grazing. Recreational developments consist of Lake Roberts, tourism and local development. There are many established trails above and below this segment.

The Nature Conservancy recently acquired the allotments in this subwatershed, and the allotments are no longer grazed by cattle.

Coordination

In this watershed public awareness and involvement will be crucial to the successful implementation of this plan and improved water quality.

Staff from the SWQB is available to work with stakeholders to provide the guidance in developing the Watershed Restoration Action Strategy (WRAS). The WRAS is a written plan intended to provide a long-range vision for various activities and management of resources in a watershed. It includes opportunities for private landowners and public agencies to reduce and prevent impacts to water quality.

This long-range strategy will become instrumental in coordinating and achieving a reduction of turbidity and organic carbon contributions, and will be used to prevent water quality impacts in the watershed. SWQB staff is available to provide any technical assistance such as selection and application of BMPs needed to meet WRAS goals.

The SWQB cooperates with stakeholders in this watershed and encourages the implementation of BMPs. Certain reaches in the Sapillo Creek watershed may be suitable habitat for beaver that face eradication in other locations. Beaver activities can bring about a rapid growth of riparian vegetation, change an ephemeral stream into a perennial stream, capture sediment, raise the water table, and reduce flood velocities. SWQB encourages efficient management of livestock and wildlife. Lastly, SWQB will encourage all landowners in the watershed to consider road issues that may cause impairment of the streams ability to function.

Stakeholders in this process will include SWQB, and other members of the WRAS group such as The Nature Conservancy, the Gila Monster (GM) group, Gila National Forest (GNF), State Game and Fish (NMSGF), the Upper Gila Watershed Alliance, the New Mexico State Highway Department (NMSHD) and other private landowners. Stakeholder public outreach and involvement in the implementation of this TMDL will be ongoing.

Timeline

The New Mexico Nonpoint Source Management Program December 1999, published by the New Mexico Environment Department, describes the dynamics of our attempts to reduce nonpoint source pollution. The following is an anticipated timeline for TMDL implementation in this watershed.

Implementation Actions	Year 1	Year 2	Year 3	Year 4	Year 5
Public Outreach and Involvement	X	X	X	X	X
Establish Milestones	X				
Secure Funding	X		X		
Implement Management Measures (BMPs)		X	X		
Monitor BMPs		X	X	X	
Determine BMP Effectiveness				X	X
Re-evaluate Milestones				X	X

Section 319(h) Funding Options

The Watershed Protection Section of the SWQB provides USEPA 319(h) funding to assist in implementation of BMPs to address water quality problems on reaches listed on the 303(d) list or which are located within Category I Watersheds as identified under the Unified Watershed Assessment of the Clean Water Action Plan. These monies are available to all private, for profit, and nonprofit organizations that are authenticated legal entities, or governmental jurisdictions including: cities, counties, tribal entities, Federal agencies, or agencies of the State. Proposals are submitted by applicants through a request for proposals (RFP) process and require a non-federal match of 40% of the total project cost consisting of funds and/or in-kind services. Further information on funding from the Clean Water Act, Section 319(h) can be found at the New Mexico Environment Department website: http://www.nmenv.state.nm.us/swqb/wpstop.html.

Assurances

New Mexico's Water Quality Act (Act) does authorize the Water Quality Control Commission to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. The Act authorizes a constituent agency to take enforcement action against any person who violates a water quality standard. Several statutory provisions on nuisance law could also be applied to nonpoint source water pollution. The Water Quality Act also states in § 74-6-12(a):

> *The Water Quality Act (this article) does not grant to the commission or to any other entity the power to take away or modify the property rights in water, nor is it the intention of the Water Quality Act to take away or modify such rights.*

In addition, the State of New Mexico surface water quality standards (Sections 20.6.4.6.C and 20.6.4.10.C NMAC) states*:*

> *These water quality standards do not grant the Commission or any other entity the power to create, take away or modify property rights in water.*

New Mexico policies are in accordance with the federal Clean Water Act §101(g):

> *It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing in this Act shall be construed to supersede or abrogate rights to quantities of water, which have been established by any State.*
>
> *Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce and eliminate pollution in concert with programs for managing water resources.*

New Mexico's Clean Water Action Plan has been developed in a coordinated manner with the State's 303(d) process.

All Category I watersheds identified in New Mexico's Unified Watershed Assessment process are totally coincident with the impaired waters lists for 1996 and 1998 as approved by EPA. The State has given a high priority for funding, assessment, and restoration activities to these watersheds.

The description of legal authorities for regulatory controls/management measures in New Mexico's Water Quality Act does not contain enforceable prohibitions directly applicable to nonpoint sources of pollution.

The Act does authorize the Water Quality Control Commission to "promulgate and publish regulations to prevent or abate water pollution in the state" and to require permits. Several statutory provisions on nuisance law could also be applied to nonpoint source water pollution.

Nonpoint source water quality management utilizes a voluntary approach. The State provides technical support and grant monies for implementation of BMPs and other NPS prevention mechanisms through §319 of the Clean Water Act. Since portions of this TMDL will be implemented through NPS control mechanisms, the New Mexico Watershed Protection Program will target efforts to this and other watersheds with TMDLs. The Watershed Protection Program coordinates with the Nonpoint Source Taskforce. The Nonpoint Source Taskforce is the New Mexico statewide focus group representing federal and state agencies, local governments, tribes and pueblos, soil and water conservation districts, environmental organizations, industry, and the public. This group meets on a quarterly basis to provide input on the §319 program process, to disseminate information to other stakeholders and the public regarding nonpoint source issues, to identify complementary programs and sources of funding, and to help review and rank §319 proposals.

Milestones

Milestones will be used to determine if control actions are being implemented and standards attained. For this TMDL, several milestones will be established which will vary and will be determined by the BMPs implemented. Examples of milestones for TOC include a decrease in total organic carbon measurements, erosion from streambanks, an increase in established riparian vegetation, or an increase in the miles of properly maintained roads.

Milestones will be coordinated by SWQB staff and will be re-evaluated periodically, depending on which BMPs were implemented. Further implementation of this TMDL will be revised based on this reevaluation. As additional information becomes available during the implementation of the TMDL, the targets, load capacity, and allocations may need to be changed. In the event that new data or information shows that changes are warranted, TMDL revisions will be made with assistance of watershed stakeholders.

The re-examination process will involve: monitoring pollutant loading, tracking implementation and effectiveness of controls, assessing water quality trends in the waterbody, and re-evaluating the TMDL for attainment of water quality standards. Although specific targets and allocations are identified in the TMDL, the ultimate success of the TMDL is not whether these targets and allocations are met, but whether beneficial uses and water quality standards are achieved.

Public Participation

Public participation was solicited in development of these TMDLs. See Appendix E for flow chart of the public participation process. The draft TMDLs were made available for a 30-day comment period starting **October 14, 2001**. Response to comments is attached as Appendix F of this document. The draft document notice of availability was extensively advertised via newsletters, email distribution lists, webpage postings (http://www.nmenv.state.nm.us/public_notice.htm) and press releases to area newspapers.

References Cited

Forest Guardians and Southwest Environmental Center v. Carol Browner, Administrator, US EPA, Civil Action 96-0826 LH/LFG, 1997.

SWQB/NMED. 2001. Quality Assurance Project Plan. Rev No.6. March, 9.

SWQB/NMED. 2000. State of New Mexico Procedures for Assessing Standards Attainment for 303(d) List and 305(b) Report. October.

SWQB/NMED. 1999. Pollutant Source(s) Documentation Protocol. July.

USEPA. 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. EPA-840-B-92-002. Washington, D.C.

USGS. 1994. Water Resources Data New Mexico Water Year 1993. Data Report NM-93-1. Albuquerque, NM.

Impacts of Dissolved Organic Carbon on Water Treatment Processes - Development of a Predictive Model for Process Optimisation (sic)." J. van Leeuwen, D. Bursill, C. Chow and M. Drikas. March 1998 in Improving Drinking Water Quality from Surface Water Sources.Australia - Germany Collaboration on Water and Environment R&D.

Federal Remediation Technology Roundtable. 1998) Remediation Technologies Screening Matrix and Reference Guide Version 3.0 (1997): 4 pp. Online. Internet. 18 April. 1998.

Appendices

Appendix A: Conversion Factor Derivation

Appendix B: 4Q3 Derivation

Appendix C: Data used for TMDL Field Measurement Calculations in Table 2 and graphical TOC Exceedences

Appendix D: Pollutant Source(s) Documentation Protocol

Appendix E: Public Participation Process Flowchart

Appendix F: Response to Comments

Appendix A: Conversion Factor Derivation

8.34 Conversion Factor Derivation

Million gallons/day **x** Milligrams/liter **x** 8.34 = pounds/day

10^6~~gallons~~/day **x** 3.7854 liters/~~1 gallon~~ **x** 10^{-3}gram/liter **x** 1 pound/454 ~~grams~~ = pounds/day

10^6 (10^{-3}) (3.7854)/454 = 3785.4/454

= 8.3379
= **8.34**

Appendix B: 4Q3 Derivation

The regression model developed for the 52 gaging stations in physiographic regions in New Mexico is as follows:

$$4Q3 = 1.409 \times 10^{-4} DA^{0.43} P_w^{3.11}$$

Where;

4Q3 = 4-day, 3-year, low-flow frequency, in cubic feet per second;

DA = drainage area, in square miles; and

P_w = average basin mean winter precipitation 1961-1990, in inches

Sapillo Creek

$P_w = 9.26$

DA = 173

Slope = 0.271

Elevation = 6978

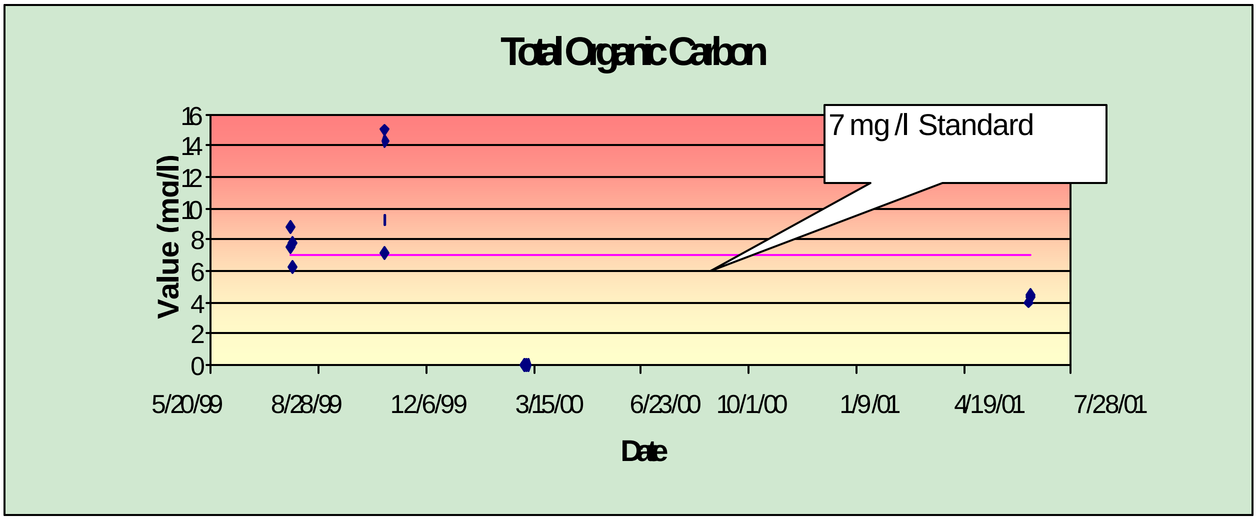
$$1.31 \text{ cfs} = 1.409 \times 10^{-4} (173)^{0.43} (9.26)^{3.11}$$

Appendix C: Data Used for TMDL Field Measurement Calculations in Table 2 of the TMDL Document

Location	Date	TOC (mg/l)
Blw Lake Roberts	**8/2/99**	**7.5***
Blw Lake Roberts	8/3/99	6.3
Blw Lake Roberts	**10/28/99**	**15***
Blw Lake Roberts	**10/29/99**	**14.2***
Blw Lake Roberts	3/6/00	5k
Blw Lake Roberts	3/7/00	5k
Blw Lake Roberts	3/8/00	5k
Blw Lake Roberts	3/9/00	5k
At Wilderness Bdy	**8/2/99**	**8.7***
At Wilderness Bdy	**8/3/99**	**7.72***
At Wilderness Bdy	**10/28/99**	**7.1***
At Wilderness Bdy	**10/29/99**	**9.22***
At Wilderness Bdy	3/6/00	5k
At Wilderness Bdy	3/7/00	5k
At Wilderness Bdy	3/8/00	5k
At Wilderness Bdy	3/9/00	5k
Blw Lake Roberts	6/19/01	4.03
Blw Lake Roberts	6/20/01	4.32
Blw Lake Roberts	6/21/01	4.56

Geometric Mean of the Exceedences	**9.51**
Number of Samples	**19**
Number of Exceedences	**7**
Exceedence Percentage	**37%**
Designated Use Support	**Not Supporting**

*** Denotes exceedence of the standard**


Total Organic Carbon
7 mg/l Standard
Value (mg/l)
0
2
4
6
8
10
12
14
16
5/20/99
8/28/99
12/6/99
3/15/00
6/23/00
10/1/00
1/9/01
4/19/01
7/28/01
Date

Appendix D: Pollutant Source(s) Documentation Protocol

POLLUTANT SOURCE(S) DOCUMENTATION PROTOCOL

New Mexico Environment Department
Surface Water Quality Bureau
July 1999

This protocol was designed to support federal regulations and guidance requiring states to document and include probable source(s) of pollutant(s) in their §303(d) Lists as well as the States §305(b) Report to Congress.

The following procedure should be used when sampling crews are in the field conducting water quality surveys or at any other time field staff are collecting data.

Pollutant Source Documentation Steps:

1). Obtain a copy of the most current §303(d) List.

2). Obtain copies of the **Field Sheet for Assessing Designated Uses and Nonpoint Sources of Pollution**.

3). Obtain digital camera that has time/date photo stamp on it from the Watershed Protection Section.

4). Obtain GPS unit and instructions from Neal Schaeffer.

5). Identify the reach(s) and probable source(s) of pollutant in the §303(d) List associated with the project that you will be working on.

6). Verify if current source(s) listed in the §303(d) List are accurate.

7). Check the appropriate box(s) on the field sheet for source(s) of nonsupport and estimate percent contribution of each source.

8). Photodocument probable source(s) of pollutant.

9). GPS the probable source site.

10). Give digital camera to Gary King for him to download and create a working photo file of the sites that were documented.

11). Give GPS unit to Neal Schaeffer for downloading and correction factors.

12). Enter the data off of the **Field Sheet for Assessing Designated Uses and Nonpoint Sources of Pollution** into the database.

13). Create a folder for the administrative files, insert field sheet and photodocumentation into the file.

This information will be used to update §303(d) Lists and the States §305(b) Report to Congress.

FIELD SHEET FOR ASSESSING DESIGNATED USES AND NONPOINT SOURCES OF POLLUTION

CODES FOR USES NOT FULLY SUPPORTED

☐	HQCWF =	HIGH QUALITY COLDWATER FISHERY	☐	DWS =	DOMESTIC WATER SUPPLY
☐	CWF =	COLDWATER FISHERY	☐	PC =	PRIMARY CONTACT
☐	MCWF =	MARGINAL COLDWATER FISHERY	☐	IRR =	IRRIGATION
☐	WWF =	WARMWATER FISHERY	☐	LW =	LIVESTOCK WATERING
☐	LWWF =	LIMITED WARMWATER FISHERY	☐	WH =	WILDLIFE HABITAT

Fish culture, secondary contact and municipal and industrial water supply and storage are also designated in particular stream reaches where these uses are actually being realized. However, no numeric standards apply uniquely to these uses.

REACH NAME:

SEGMENT NUMBER:

BASIN:

PARAMETER:

STAFF MAKING ASSESSMENT:

DATE:

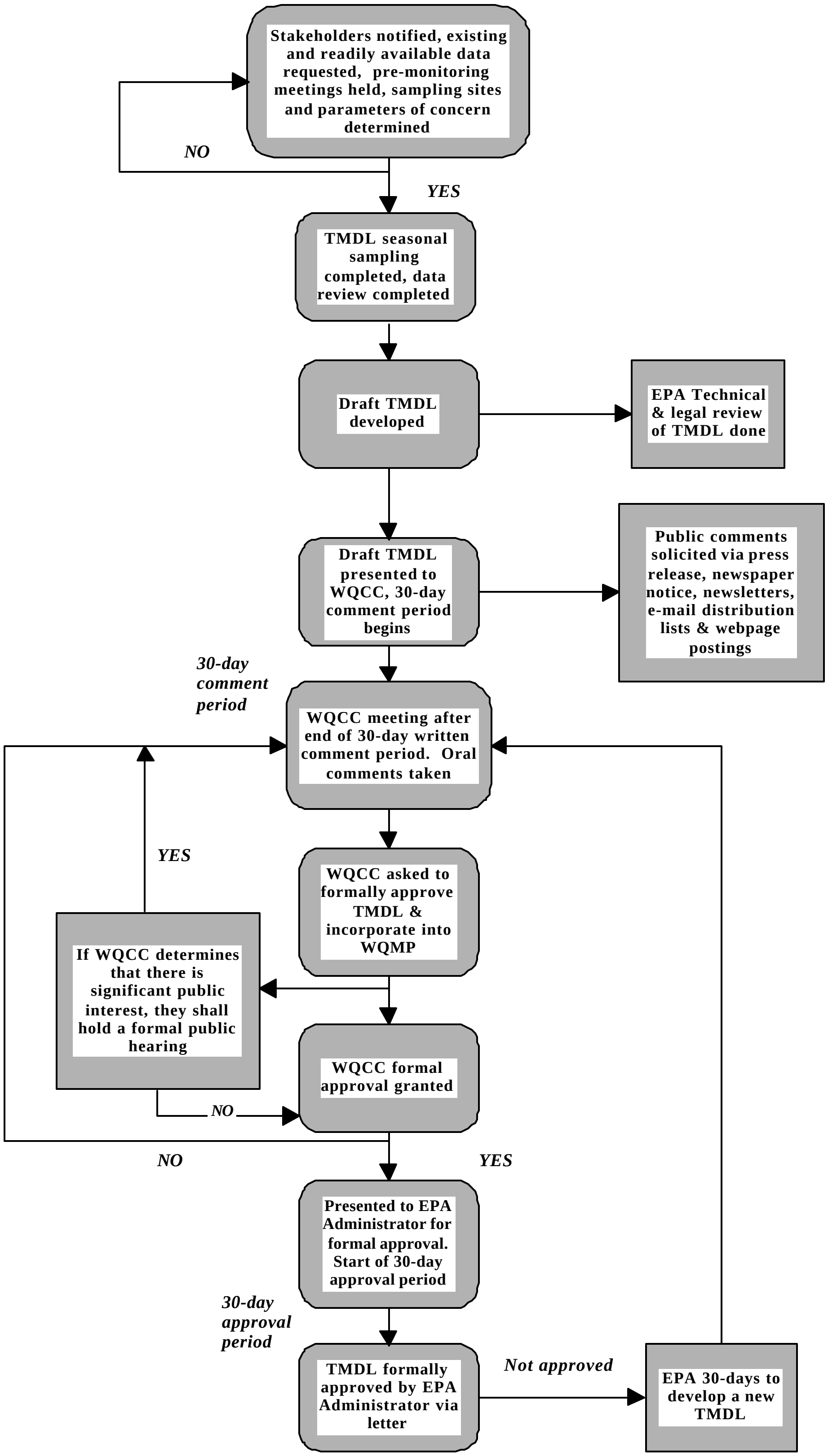
CODES FOR SOURCES OF NONSUPPORT (CHECK ALL THAT APPLY)

- ☐ <u>0100</u> <u>INDUSTRIAL POINT SOURCES</u>
- ☐ <u>0200</u> <u>MUNICIPAL POINT SOURCES</u>
- ☐ 0201 DOMESTIC POINT SOURCES
- ☐ <u>0400</u> <u>COMBINED SEWER OVERFLOWS</u>
- ☐ <u>1000</u> AGRICULTURE
- ☐ 1100 NONIRRIGATED CROP PRODUCTION
- ☐ 1200 IRRIGATED CROP PRODUCTION
- ☐ 1201 IRRIGATED RETURN FLOWS
- ☐ 1300 SPECIALTY CROP PRODUCTION (e.g., truck farming and orchards)
- ☐ 1400 PASTURELAND
- ☐ 1500 RANGELAND
- ☐ 1600 FEEDLOTS - ALL TYPES
- ☐ 1700 AQUACULTURE
- ☐ 1800 ANIMAL HOLDING/MANAGEMENT AREAS
- ☐ 1900 MANURE LAGOONS
- ☐ <u>2000</u> <u>SILVICULTURE</u>
- ☐ 2100 HARVESTING, RESTORATION, RESIDUE MANAGEMENT
- ☐ 2200 FOREST MANAGEMENT
- ☐ 2300 ROAD CONSTRUCTION or MAINTENANCE
- ☐ <u>3000</u> <u>CONSTRUCTION</u>
- ☐ 3100 HIGHWAY/ROAD/BRIDGE
- ☐ 3200 LAND DEVELOPMENT
- ☐ 3201 RESORT DEVELOPMENT
- ☐ 3300 HYDROELECTRIC

- ☐ <u>4000</u> <u>URBAN RUNOFF/STORM SEWERS</u>
- ☐ 5000 <u>RESOURCES EXTRACTION</u>
- ☐ 5100 SURFACE MINING
- ☐ 5200 SUBSURFACE MINING
- ☐ 5300 PLACER MINING
- ☐ 5400 DREDGE MINING
- ☐ 5500 PETROLEUM ACTIVITIES
- ☐ 5501 PIPELINES
- ☐ 5600 MILL TAILINGS
- ☐ 5700 MINE TAILINGS
- ☐ 5800 ROAD CONSTRUCTION/MAINTENANCE 8400
- ☐ 5900 SPILLS
- ☐ <u>6000</u> <u>LAND DISPOSAL</u>
- ☐ 6100 SLUDGE
- ☐ 6200 WASTEWATER
- ☐ 6300 LANDFILLS
- ☐ 6400 INDUSTRIAL LAND TREATMENT
- ☐ 6500 ONSITE WASTEWATER SYSTEMS (septic tanks, etc.)
- ☐ 6600 HAZARDOUS WASTE
- ☐ 6700 SEPTAGE DISPOSAL
- ☐ 6800 UST LEAKS
- ☐ <u>7000</u> <u>HYDROMODIFICATION</u>
- ☐ 7100 CHANNELIZATION
- ☐ 7200 DREDGING
- ☐ 7300 DAM CONSTRUCTION/REPAIR

- ☐ 7400 FLOW REGULATION/MODIFICATION
- ☐ 7500 BRIDGE CONSTRUCTION
- ☐ 7600 REMOVAL OF RIPARIAN VEGETATION
- ☐ 7700 STREAMBANK MODIFICATION OR DESTABILIZATION
- ☐ 7800 DRAINING/FILLING OF WETLANDS
- ☐ <u>8000</u> <u>OTHER</u>
- ☐ 8010 VECTOR CONTROL ACTIVITIES
- ☐ 8100 ATMOSPHERIC DEPOSITION
- ☐ 8200 WASTE STORAGE/STORAGE TANK LEAKS
- ☐ 8300 ROAD MAINTENANCE or RUNOFF
- ☐ 8400 SPILLS
- ☐ 8500 IN-PLACE CONTAMINANTS
- ☐ 8600 NATURAL
- ☐ 8700 RECREATIONAL ACTIVITIES
- ☐ 8701 ROAD/PARKING LOT RUNOFF
- ☐ 8702 OFF-ROAD VEHICLES
- ☐ 8703 REFUSE DISPOSAL
- ☐ 8704 WILDLIFE IMPACTS
- ☐ 8705 SKI SLOPE RUNOFF
- ☐ 8800 UPSTREAM IMPOUNDMENT
- ☐ 8900 SALT STORAGE SITES
- ☐ <u>9000</u> <u>SOURCE UNKNOWN</u>

Appendix E: Public Participation Flow Chart



Appendix F: Response to Comments

To be completed later.